

WHAT IS CLAIMED IS:

1. A lens driving device comprising:  
a moving body having a lens; and  
5 a fixed body that moveably supports the moving body in an optical axis direction of the lens,  
wherein the moving body is equipped with one of a drive magnet and a drive coil, the fixed body is equipped with another of the drive magnet and the drive coil, and the drive magnet and the drive coil moveably dispose the  
10 moving body in the optical axis direction by one of mutual magnetic attractive force and mutual magnetic repelling force working between the drive magnet and the drive coil.
2. A lens driving device according to claim 1, wherein the drive  
15 coil is circularly wound about the optical axis of the lens, and the drive magnet is formed in a ring shape having a hole in a center thereof.
3. A lens driving device according to claim 2, wherein the ring-  
shaped drive magnet has an inner circumferential section that surrounds  
20 the hole and an outer circumferential section, wherein the inner circumferential section of the drive magnet is magnetized with a single pole of one of N pole and S pole, and the outer circumferential section is magnetized with a single pole of another of N pole and S pole.

4. A lens driving device according to claim 1, further comprising a position retaining device that retains the moving body with respect to the fixed body at a specified position when energization of the drive coil stops.

5

5. A lens driving device according to claim 4, wherein the position retaining device is a magnetic device that retains the moving body with a magnetic attraction force at the specified position.

10

6. A lens driving device comprising:

a moving body having a lens and a drive magnet that is moveable with the lens in an optical axis direction of the lens; and

a fixed body that moveably supports the moving body in the optical axis direction, the fixed body including a first drive coil and a second drive coil that are disposed in the optical axis direction and form magnetic circuits with the drive magnet, and a first magnetic member and a second magnetic member that are disposed opposite the first drive coil and the second drive coil, respectively,

wherein the moving body is retained at a first specified position by magnetic attraction working between the drive magnet and the first magnetic member when energization of the first drive coil is stopped.

7. A lens driving device according to claim 6, wherein the moving

body is retained at a second specified position by magnetic attraction working between the drive magnet and the second magnetic member when energization of the second drive coil is stopped.

5           8.     A lens driving device according to claim 6, wherein the moving body is moved between the first drive coil and the second drive coil through energization of at least one of the first drive coil and the second drive coil.

          9.     A lens driving device according to claim 6, wherein the drive  
10 magnet is disposed between the first drive coil and the second drive coil.

          10.    A lens driving device according to claim 6, wherein the moving body includes a cylindrical lens barrel that retains the lens, and the ring-shaped drive magnet is affixed in one piece to an outer circumference of the  
15 lens barrel.

          11.    A lens driving device comprising:  
a moving body equipped with a lens, and a drive coil and a magnetic member that are moveable with the lens in an optical direction of the lens;  
20 and

a fixed body that moveably supports the moving body in the optical axis direction of the lens, wherein the fixed body includes a first drive magnet and a second drive magnet that are disposed in the optical axis

direction with the drive coil being interposed in between and that form together with the drive coil a magnetic circuit,

wherein the moving body is retained at a specified position by magnetic attraction between the magnetic member and one of the first drive magnet and the second drive magnet, when energization of the drive coil is stopped.

12. A lens driving device according to claim 11, wherein the moving body is moved between the first drive magnet and the second drive magnet, when the drive coil is energized.

13. A lens driving device according to claim 11, further comprising a buffer member disposed on the fixed body, wherein the buffer member transmits light from outside and prevents the moving body from moving outward.

14. A portable equipment with camera comprising:  
a camera unit; and  
a lens driving device mounted on the camera unit, wherein  
the lens driving device comprises a moving body having a lens, and a fixed body that moveably supports the moving body in an optical axis direction of the lens, wherein the moving body comprises one of a drive magnet and a drive coil, and the fixed body comprises another of the drive magnet and the

drive coil, and the drive magnet and the drive coil moveably dispose the moving body in the optical axis direction by one of mutual magnetic attractive force and mutual magnetic repelling force working between the drive magnet and the drive coil.

5

15. A portable equipment with camera according to claim 14, wherein the drive coil is wound around the optical axis of the lens, and the drive magnet is formed in a ring shape having a hole in a center thereof.

10 16. A portable equipment with camera according to claim 15 wherein the ring-shaped drive magnet has an inner circumferential section that surrounds the hole and an outer circumferential section, wherein the inner circumferential section of the drive magnet is magnetized with a single pole of one of N pole and S pole, and the outer circumferential section  
15 is magnetized with a single pole of the other of N pole and S pole.

17. A portable equipment with camera according to claim 14, further comprising a position retaining device that retains the moving body with respect to the fixed body at a specified position when energization of  
20 the drive coil stops.

18. A portable equipment with camera according to claim 17, wherein the position retaining device is a magnetic device that retains the

moving body with a magnetic attraction force at the specified position.

19. A portable equipment with camera comprising:

5 a camera unit; and

a lens driving device mounted on the camera unit, wherein the lens driving device comprises a moving body having a lens and a drive magnet that is moveable with the lens in an optical axis direction of the lens, and a fixed body that moveably supports the moving body in the optical axis  
10 direction, the fixed body including a first drive coil and a second drive coil that are disposed in the optical axis direction and form magnetic circuits with the drive magnet, and a first magnetic member and a second magnetic member that are disposed opposite the first drive coil and the second drive coil, respectively, wherein the moving body is retained at a first specified  
15 position by magnetic attraction working between the drive magnet and the first magnetic member when energization of the first drive coil is stopped.

20. A portable equipment with camera according to claim 19,

wherein the moving body is retained at a second specified position by  
20 magnetic attraction working between the drive magnet and the second magnetic member when energization of the second drive coil is stopped.

21. A portable equipment with camera according to claim 19,

wherein the moving body is moved between the first drive coil and the second drive coil through energization of at least one of the first drive coil and the second drive coil.

- 5           22. A portable equipment with camera according to claim 19, wherein the drive magnet is disposed between the first drive coil and the second drive coil.

23. A portable equipment with camera according to claim 19,  
10 wherein the moving body includes a cylindrical lens barrel that retains the lens, and the ring-shaped drive magnet is affixed in one piece to an outer circumference of the lens barrel.

24. A portable equipment with camera comprising:  
15 a camera unit; and  
a lens driving device mounted on the camera unit, wherein the lens driving device comprises a moving body that is equipped with a lens, and a drive coil and a magnetic member that are moveable with the lens in an optical direction of the lens, and a fixed body that moveably supports the  
20 moving body in the optical axis direction of the lens, wherein the fixed body includes a first drive magnet and a second drive magnet that are disposed in the optical axis direction with the drive coil being interposed in between and that form together with the drive coil a magnetic circuit,

and the moving body is retained at a specified position by magnetic attraction between the magnetic member and one of the first drive magnet and the second drive magnet, when energization of the drive coil is stopped.

- 5           25. A portable equipment with camera according to claim 24, wherein the moving body is moved between the first drive magnet and the second drive magnet, when the drive coil is energized.

26. A portable equipment with camera according to claim 24,  
10 further comprising a buffer member disposed on the fixed body, wherein the buffer member transmits light from outside and prevents the moving body from moving outward.

27. A portable equipment with camera comprising:  
15 a lens driving device defining an object lens side and an inner side opposite the object lens side, the lens driving device comprising a moving body having a lens, and a fixed body that moveably supports the moving body in an optical axis direction of the lens, wherein the moving body is equipped with one of a drive magnet and a drive coil, the fixed body is  
20 equipped with another of the drive magnet and the drive coil, and the drive magnet and the drive coil moveably dispose the moving body in the optical axis direction by one of mutual magnetic attractive force and mutual magnetic repelling force working between the drive magnet and the drive

coil;

a cover disposed on the object lens side of the lens driving device, and having an outer surface that is exposed, wherein the cover transmits light from outside and seals an interior of the lens driving device;

5        an image pickup element that is disposed on an opposite side of the cover in the optical axis direction with the lens of the lens driving device interposed in between; and

a circuit substrate that is connected to the image pickup element, wherein the circuit substrate is disposed in the rear of the lens driving  
10    device within a diameter of the lens driving device.

28.    A portable equipment with camera comprising:

a lens driving device defining an object lens side and an inner side opposite the object lens side, the lens driving device comprising a moving  
15    body having a lens and a drive magnet that is moveable with the lens in an optical axis direction of the lens, and a fixed body that moveably supports the moving body in the optical axis direction, the fixed body including a first drive coil and a second drive coil that are disposed in the optical axis direction and form magnetic circuits with the drive magnet, and a first  
20    magnetic member and a second magnetic member that are disposed opposite the first drive coil and the second drive coil, respectively, wherein the moving body is retained at a first specified position by magnetic attraction working between the drive magnet and the first magnetic member when

energization of the first drive coil is stopped;

a cover disposed on the object lens side of the lens driving device, and having an outer surface that is exposed, wherein the cover transmits light from outside and seals an interior of the lens driving device;

5 a image pickup element that is disposed on an opposite side of the cover in the optical axis direction with the lens of the lens driving device interposed in between; and

a circuit substrate that is connected to the image pickup element, wherein the circuit substrate is disposed in the rear of the lens driving  
10 device within a diameter of the lens driving device.

29. A portable equipment with camera comprising:

a lens driving device defining an object lens side and an inner side opposite the object lens side, the lens driving device comprising a moving  
15 body equipped with a lens, and a drive coil and a magnetic member that are moveable with the lens in an optical direction of the lens, and a fixed body that moveably supports the moving body in the optical axis direction of the lens, wherein the fixed body includes a first drive magnet and a second drive magnet that are disposed in the optical axis direction with the drive coil  
20 being interposed in between and that form together with the drive coil a magnetic circuit, wherein the moving body is retained at a specified position by magnetic attraction between the magnetic member and one of the first drive magnet and the second drive magnet, when energization of the drive

coil is stopped;

a cover disposed on the object lens side of the lens driving device, and having an outer surface that is exposed, wherein the cover transmits light from outside and seals an interior of the lens driving device;

5 an image pickup element that is disposed on an opposite side of the cover in the optical axis direction with the lens of the lens driving device interposed in between; and

a circuit substrate that is connected to the image pickup element, wherein the circuit substrate is disposed in the rear of the lens driving  
10 device within a diameter of the lens driving device.